

**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Reissue Application No.: Not Yet Assigned

Patent No. 5,952,983

Filed: August 6, 2001

Granted: September 14, 1999

Patentee: Dearnley et al.

Atty. Dckt No.: 47176-00434USPR

Title: HIGH ISOLATION DUAL  
POLARIZED ANTENNA SYSTEM  
USING DIPOLE RADIATING  
ELEMENTS

**PRELIMINARY AMENDMENT "A"  
TO REISSUE APPLICATION**

**CERTIFICATE OF MAILING**

I hereby certify that this correspondence is being deposited with the U.S. Postal Service as Express Mail in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. on the date indicated below:

8/16/2001  
Date

Corinne L. Roempagel  
Corinne L. Roempagel

Commissioner For Patents  
Washington, D.C. 20231

Dear Commissioner:

Please enter the following amendments before examination of the above-referenced reissue patent application:

**In the Claims**

Please add claims 30-37 as follows:

30. (New) An antenna comprising:

a ground plane;

a plurality of antenna components, each component comprising orthogonal, linearly polarized radiating structures electromagnetically coupled to said ground plane and producing electromagnetic fields upon receipt of electromagnetic signals, the individual electromagnetic

fields of said antenna components undesirably interacting with each other to impair the overall performance of the antenna;

at least one independent, electrically conductive parasitic element electrically unconnected to any of said antenna components, said electromagnetic fields produced by said antenna components inducing currents in said parasitic element; and

said at least one parasitic element being constructed, and being arranged relative to said antenna components, such that said currents induced in said at least one parasitic element by said electromagnetic fields reduce said undesirable interaction between said electromagnetic fields of said antenna components.

31. (New) The antenna of claim 30 wherein said radiating elements comprise first and second co-located, orthogonal dipoles, said dipoles aligned at first and second predetermined angles with respect to a vertical axis defined by said ground plane.

32. (New) The antenna of claim 31 wherein said first predetermined angle is substantially equal to +45 degrees with respect to said vertical axis and said second predetermined angle is substantially equal to -45 degrees with respect to said vertical axis.

33. (New) The antenna of claim 31 and further including at least one non-conductive support, said support connected to said ground plane and perpendicular to said vertical axis and placed between selected ones of said plurality of dipole radiating elements for supporting said at least one parasitic element.

34. (New) A method of providing an antenna having improved isolation, said method comprising:

providing a ground plane;

providing a plurality of antenna components, each component comprising orthogonal, linearly polarized radiating structures electromagnetically coupled to said ground plane and producing electromagnetic fields upon receipt of electromagnetic signals, the individual

electromagnetic fields of said antenna components undesirably interacting with each other to impair the overall performance of the antenna;

providing at least one independent, electrically conductive parasitic element electrically unconnected to any of said antenna components, said electromagnetic fields produced by said antenna components inducing currents in said parasitic element; and

said at least one parasitic element being constructed, and being arranged relative to said antenna components, such that said currents induced in said at least one parasitic element by said electromagnetic fields reduce said undesirable interaction between said electromagnetic fields of said antenna components.

35. (New) The method of claim 34 wherein providing said radiating elements comprise first and second co-located, orthogonal dipoles, said dipoles aligned at first and second predetermined angles with respect to a vertical axis defined by said ground plane.

36. (New) The method of claim 35 wherein said first predetermined angle is substantially equal to +45 degrees with respect to said vertical axis and said second predetermined angle is substantially equal to -45 degrees with respect to said vertical axis.

37. (New) The method of claim 35 and further including providing at least one non-conductive support, said at least one support connected to said ground plane and perpendicular to said vertical axis and placed between selected ones of said plurality of dipole radiating elements for supporting said at least one parasitic element.

#### REMARKS

Please enter the above amendmendments prior to a first action on the merits. Attached hereto is a clean copy of the pending claims after entry of the present amendment captioned **“Pending Claims After Entry of Amendment “A” to the Reissue Application.”**

The amount of \$304.00 is included in the check for reissue application filing fees to cover the fee for additional claims. The Commissioner is authorized to deduct any additional fees

1990-1991		1991-1992		1992-1993		1993-1994		1994-1995		1995-1996		1996-1997		1997-1998		1998-1999		1999-2000		2000-2001		2001-2002		2002-2003		2003-2004		2004-2005		2005-2006		2006-2007		2007-2008		2008-2009		2009-2010		2010-2011		2011-2012		2012-2013		2013-2014		2014-2015		2015-2016		2016-2017		2017-2018		2018-2019		2019-2020		2020-2021		2021-2022		2022-2023		2023-2024		2024-2025		2025-2026		2026-2027		2027-2028		2028-2029		2029-2030		2030-2031		2031-2032		2032-2033		2033-2034		2034-2035		2035-2036		2036-2037		2037-2038		2038-2039		2039-2040		2040-2041		2041-2042		2042-2043		2043-2044		2044-2045		2045-2046		2046-2047		2047-2048		2048-2049		2049-2050		2050-2051		2051-2052		2052-2053		2053-2054		2054-2055		2055-2056		2056-2057		2057-2058		2058-2059		2059-2060		2060-2061		2061-2062		2062-2063		2063-2064		2064-2065		2065-2066		2066-2067		2067-2068		2068-2069		2069-2070		2070-2071		2071-2072		2072-2073		2073-2074		2074-2075		2075-2076		2076-2077		2077-2078		2078-2079		2079-2080		2080-2081		2081-2082		2082-2083		2083-2084		2084-2085		2085-2086		2086-2087		2087-2088		2088-2089		2089-2090		2090-2091		2091-2092		2092-2093		2093-2094		2094-2095		2095-2096		2096-2097		2097-2098		2098-2099		2099-2100		2100-2101		2101-2102		2102-2103		2103-2104		2104-2105		2105-2106		2106-2107		2107-2108		2108-2109		2109-2110		2110-2111		2111-2112		2112-2113		2113-2114		2114-2115		2115-2116		2116-2117		2117-2118		2118-2119		2119-2120		2120-2121		2121-2122		2122-2123		2123-2124		2124-2125		2125-2126		2126-2127		2127-2128		2128-2129		2129-2130		2130-2131		2131-2132		2132-2133		2133-2134		2134-2135		2135-2136		2136-2137		2137-2138		2138-2139		2139-2140		2140-2141		2141-2142		2142-2143		2143-2144		2144-2145		2145-2146		2146-2147		2147-2148		2148-2149		2149-2150		2150-2151		2151-2152		2152-2153		2153-2154		2154-2155		2155-2156		2156-2157		2157-2158		2158-2159		2159-2160		2160-2161		2161-2162		2162-2163		2163-2164		2164-2165		2165-2166		2166-2167		2167-2168		2168-2169		2169-2170		2170-2171		2171-2172		2172-2173		2173-2174		2174-2175		2175-2176		2176-2177		2177-2178		2178-2179		2179-2180		2180-2181		2181-2182		2182-2183		2183-2184		2184-2185		2185-2186		2186-2187		2187-2188		2188-2189		2189-2190		2190-2191		2191-2192		2192-2193		2193-2194		2194-2195		2195-2196		2196-2197		2197-2198		2198-2199		2199-2200		2200-2201		2201-2202		2202-2203		2203-2204		2204-2205		2205-2206		2206-2207		2207-2208		2208-2209		2209-2210		2210-2211		2211-2212		2212-2213		2213-2214		2214-2215		2215-2216		2216-2217	
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Frank M. Ke

Date \_\_\_\_\_

CHICAGO 167665v1 47176-00434USPR

Reissue Application No. Not Yet Assigned, filed August 6, 2001

Patent No. 5,952,983, Granted September 14, 1999

Attorney Docket No. 47176-00434

**PENDING CLAIMS AFTER ENTRY OF  
AMENDMENT "A" TO THE REISSUE APPLICATION**

1. An antenna for simultaneously receiving separate electromagnetic signals comprising:
  - a ground plane with a length and having a vertical axis along said length;
  - a plurality of dipole radiating elements, said radiating elements comprised of first and second co-located, orthogonal dipoles, said dipoles aligned at first and second predetermined angles with respect to said vertical axis, said radiating elements and ground plane producing first electromagnetic fields in response to said electromagnetic signals;
  - a plurality of non-conductive supports, said supports connected to said ground plane and perpendicular to said vertical axis and placed between selected of said plurality of dipole radiating elements;
  - a plurality of independant metallic parasitic elements unconnected to said dipoles and placed in a selected of said plurality of supports, said first electromagnetic fields exciting currents in said metallic parasitic elements, said currents creating second electromagnetic fields, said second electromagnetic fields canceling with portions of said first electromagnetic fields.
2. The antenna of claim 1 whereby said first predetermined angle is substantially equal to +45 degrees with respect to said vertical axis and said second predetermined angle is substantially equal to -45 degrees with respect to said vertical axis.
3. The antenna of claim 1 wherein said parasitic elements are composed of aluminum.
4. The antenna of claim 1 wherein said support comprises an upper surface and said parasitic elements are positioned along said upper surface of said support.

5. The antenna of claim 1 wherein said plurality of supports is located midway between said radiating elements.

6. The antenna of claim 1 wherein said ground plane is composed of metal.

7. The antenna of claim 1 wherein said plurality of radiating elements includes exactly four radiating elements.

8. The antenna of claim 7 wherein said plurality of supports includes exactly two supports.

9. The antenna of claim 1 wherein said radiating elements transmit electromagnetic signals.

10. An antenna for simultaneously receiving separate electromagnetic signals comprising:

a ground plane with a length, said ground plane having a vertical axis along said length;  
a plurality of radiating elements, said radiating elements comprised of first and second co-located, orthogonal dipoles, said first dipoles aligned at substantially a +45 degree angle with respect to said vertical axis, said second dipoles aligned at substantially a -45 degree angle with respect to said vertical axis, said radiating elements and ground plane producing a first electromagnetic field;

a plurality of non-conductive supports connected to said ground plane, said supports perpendicular to said vertical axis and placed between selected of said plurality of dipole radiating elements;

a plurality of independant metallic parasitic elements unconnected to said dipoles and placed in a selected of said plurality of supports, said first electromagnetic fields exciting currents in said metallic parasitic elements, said currents creating second electromagnetic fields, said second electromagnetic fields canceling with portions of said first electromagnetic fields; and

diversity reception means coupled to said plurality of radiating elements for selecting between said plurality of electrical signals.

11. The antenna of claim 10 wherein said parasitic elements are composed of aluminum.

12. The antenna of claim 10 wherein said parasitic elements are positioned along an upper surface of said supports.

13. The antenna of claim 10 wherein said plurality of supports is located midway between said antennas.

14. The antenna of claim 10 wherein said ground plane is composed of metal.

15. The antenna of claim 10 wherein said plurality of radiating elements includes exactly four radiating elements.

16. A method for providing high isolation for an array of radiating elements comprising the steps of:

simultaneously receiving separate electromagnetic signals;

providing a ground plane having a vertical axis;

providing a plurality of dipole radiating elements, said radiating elements comprised of first and second co-located, orthogonal dipoles, said dipoles aligned at a predetermined angle with respect to said vertical axis, said radiating elements having a top surface;

producing first electromagnetic fields in said radiating elements responsive to said electromagnetic signals;

providing a plurality of non-conductive supports, and placing said supports perpendicular to said vertical axis and between selected of said plurality of dipole radiating elements;

providing a plurality of independant metallic parasitic elements unconnected to said dipoles and placed in a selected of said plurality of supports;

exciting currents in said metallic parasitic elements;  
creating second electromagnetic fields radiating from said parasitic elements; and  
canceling with portions of said first electromagnetic fields with said second  
electromagnetic fields.

17. The method of claim 16 comprising the further step of placing said parasitic elements midway between the top surfaces of said radiating elements and said ground plane.

18. The method of claim 16 comprising the further step of orienting the radiating elements at a predetermined angle with respect to the vertical axis of the array.

19. An antenna for simultaneously receiving separate electromagnetic signals comprising:

a ground plane with a length and having a vertical axis along said length;

a plurality of dipole radiating elements, said radiating elements comprised of first and second co-located, orthogonal dipoles, said dipoles aligned at first and second predetermined angles with respect to said vertical axis, said radiating elements producing first electromagnetic fields in response to said electromagnetic signals;

a plurality of non-conductive supports, said supports connected to said ground plane and parallel to said vertical axis and placed adjacent selected of said plurality of dipole radiating elements;

a plurality of independant metallic parasitic elements unconnected to said dipoles and placed in a selected of said plurality of supports, said first electromagnetic fields exciting currents in said metallic parasitic elements, said currents creating second electromagnetic fields, said second electromagnetic fields canceling with portions of said first electromagnetic fields.

20. The antenna of claim 19 whereby said first predetermined angle is substantially equal to +45 degrees with respect to said vertical axis and said second predetermined angle is substantially equal to -45 degrees with respect to said vertical axis.



21. The antenna of claim 19 wherein said parasitic elements are composed of aluminum.
22. The antenna of claim 19 wherein said supports comprises an upper surface and said parasitic elements are positioned along an upper surface of said support.
23. The antenna of claim 19 wherein said plurality of supports is located adjacent to said radiating elements.
24. The antenna of claim 19 wherein said ground plane is composed of metal.
25. The antenna of claim 19 wherein said plurality of radiating elements includes exactly three radiating elements.
26. The antenna of claim 25 wherein said plurality of supports includes exactly two sets of supports.
27. A method for providing high isolation for an array of radiating elements comprising the steps of:
  - simultaneously receiving separate electromagnetic signals;
  - providing a ground plane having a vertical axis;
  - providing a plurality of dipole radiating elements, said radiating elements comprised of first and second co-located, orthogonal dipoles, said dipoles aligned at a predetermined angle with respect to said vertical axis, said radiating elements having a top surface;
  - producing first electromagnetic fields in said radiating elements elements responsive to said electromagnetic signals;
  - providing a plurality of non-conductive supports, and placing said supports parallel to said vertical axis and adjacent selected of said plurality of dipole radiating elements;
  - providing a plurality of independant metallic parasitic elements unconnected to said dipoles and placed in a selected of said plurality of supports,

exciting currents in said metallic parasitic elements;  
creating second electromagnetic fields radiating from said parasitic elements; and  
canceling with portions of said first electromagnetic fields with said second  
electromagnetic fields.

28. The method of claim 27 comprising the further step of placing said parasitic elements midway between the top surface of said radiating element and ground plane of selected of said housings.

29. The method of claim 27 comprising the further step of orienting the radiating elements at a predetermined angle with respect to the vertical axis of the array.

30. (New) An antenna comprising:  
a ground plane;  
a plurality of antenna components, each component comprising orthogonal, linearly polarized radiating structures electromagnetically coupled to said ground plane and producing electromagnetic fields upon receipt of electromagnetic signals, the individual electromagnetic fields of said antenna components undesirably interacting with each other to impair the overall performance of the antenna;  
at least one independent, electrically conductive parasitic element electrically unconnected to any of said antenna components, said electromagnetic fields produced by said antenna components inducing currents in said parasitic element; and  
said at least one parasitic element being constructed, and being arranged relative to said antenna components, such that said currents induced in said at least one parasitic element by said electromagnetic fields reduce said undesirable interaction between said electromagnetic fields of said antenna components.

31. (New) The antenna of claim 30 wherein said radiating elements comprise first and second co-located, orthogonal dipoles, said dipoles aligned at first and second predetermined angles with respect to a vertical axis defined by said ground plane.

32. (New) The antenna of claim 31 wherein said first predetermined angle is substantially equal to +45 degrees with respect to said vertical axis and said second predetermined angle is substantially equal to -45 degrees with respect to said vertical axis.

33. (New) The antenna of claim 31 and further including at least one non-conductive support, said support connected to said ground plane and perpendicular to said vertical axis and placed between selected ones of said plurality of dipole radiating elements for supporting said at least one parasitic element.

34. (New) A method of providing an antenna having improved isolation, said method comprising:

providing a ground plane;

providing a plurality of antenna components, each component comprising orthogonal, linearly polarized radiating structures electromagnetically coupled to said ground plane and producing electromagnetic fields upon receipt of electromagnetic signals, the individual electromagnetic fields of said antenna components undesirably interacting with each other to impair the overall performance of the antenna;

providing at least one independent, electrically conductive parasitic element electrically unconnected to any of said antenna components, said electromagnetic fields produced by said antenna components inducing currents in said parasitic element; and

said at least one parasitic element being constructed, and being arranged relative to said antenna components, such that said currents induced in said at least one parasitic element by said electromagnetic fields reduce said undesirable interaction between said electromagnetic fields of said antenna components.

35. (New) The method of claim 34 wherein providing said radiating elements comprise first and second co-located, orthogonal dipoles, said dipoles aligned at first and second predetermined angles with respect to a vertical axis defined by said ground plane.

36. (New) The method of claim 35 wherein said first predetermined angle is substantially equal to +45 degrees with respect to said vertical axis and said second predetermined angle is substantially equal to -45 degrees with respect to said vertical axis.

37. (New) The method of claim 35 and further including providing at least one non-conductive support, said at least one support connected to said ground plane and perpendicular to said vertical axis and placed between selected ones of said plurality of dipole radiating elements for supporting said at least one parasitic element.

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